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analytical results are necessary in order to determine the safety of an existing water supply for human consumption.

The field survey should give an accurate idea of the possibilities of present and future pollution. The analytical results should provide information on the sanitary condition of the water at the particular time the investigation is made and possibly some information of its past history. The field survey and analytical results combined should provide data for an opinion on the safety of the supply in its existing condition and afford information on which recommendations can be made for the correction of defects or for the abandonment of an unsafe supply.

TABLE 2
Unsatisfactory water supplies, 1912-1918

	UNSATISFACTORY WATER SUPPLIES	SHOWN UNSATISFACTORY BY		
		Field survey and analytical results	Field survey	Analytical results
Number.....	730	354	338	38
Per cent	100	49	46	5

The purpose of this Comment is to emphasize the importance of complete investigation work by thoroughly trained individuals when the safety of an existing water supply is to be determined. The use of haphazard methods by unskilled individuals leads to erroneous opinions which may result in loss of life among the consumers of the water supply.

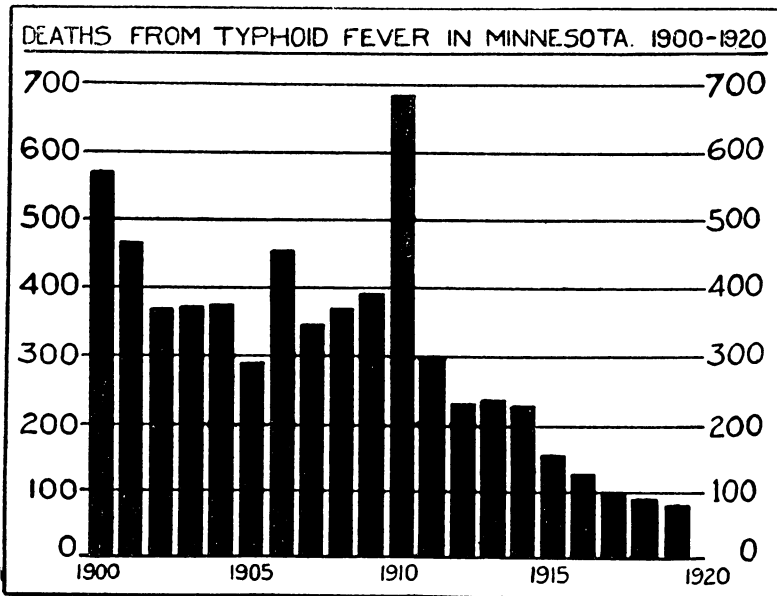
H. A. WHITTAKER.

MINNESOTA'S TYPHOID FEVER RECORD

In connection with Mr. Whittaker's comments on the value of complete investigations of the safety of water supplies, attention is called to what the work of this sort by the Minnesota State Board of Health has accomplished. The data were recently given in *Journal of the Minnesota Public Health Association*, which states that in 1910 the State Board began a pure water supply campaign. The legislature appropriated \$5000 for the work in 1911 and \$7500 for the 1912 sanitary engineering work. The next year the appropriation was cut to \$7000, at which figure it has since continued. In 1914 the Board's engineering and laboratory divisions were combined to make the present division of sanitation, which has charge of all work on water supply and sewerage systems. What it has

done in reducing typhoid fever, with the help of local authorities, is indicated by the accompanying diagram.

The average annual typhoid death rate in Minnesota from 1900 to 1910 inclusive was 428. During 1919 but 82 deaths were reported, a reduction of 246 from the yearly average from 1900 to 1910. There is an average of over twenty cases of typhoid for each death, making the reduction in the number of cases which would have occurred on that basis 6,920. This reduction has taken place in the face of a



EFFECT OF SANITARY WORK ON MINNESOTA TYPHOID FEVER RATE

25 per cent increase in population in the last twenty years. If it is assumed that a typhoid fever case costs an average of \$150 for loss of time, doctors' and nurses' fees, hospital charges, medicines and other expenses, the improved sanitary condition of the state saved \$1,038,000 and 350 lives last year. Such figures are conclusive proof of the value of that annual appropriation of \$7000.

This is by no means all the story, however, for in every hundred typhoid fever cases there are three to five of the patients who become carriers, and continue to discharge virulent typhoid germs for months after they have recovered, sometimes for years. Unless they exercise great care, these persons are very dangerous members

of society. With a reduction of 7000 cases in 1919 as compared with the 1900-1910 period, there has been a corresponding reduction in the number of carriers, through the efficient work of the division of preventable disease.

Excellent as these records are, great as have been the strides forward in making water supplies safe, Mr. Whittaker's investigations show that there are many supplies which are unsafe. The work has reduced the hazards, but it has to be continuous and energetic to keep the hazards reduced. To bring about still more improvement means greater expenditures, for it is usually the easier problems to solve which are finished first, and as the field is covered the unit cost of accomplishing what is left generally rises. When the chart of what has been done is studied, when one reflects what suffering to the sick and anguish to their families have been saved for this small expenditure of \$7000 annually, it is difficult to understand why all the money necessary to make the work more thorough and comprehensive cannot be found by the legislature of a state as wealthy as Minnesota.

JOHN M. GOODELL.

WILL CITIES EVER LEARN FROM THE EXPERIENCE OF OTHER CITIES
HOW TO PROTECT THEIR PUBLIC WATER SUPPLIES?

Again an Illinois city has had the lesson brought home of the danger of permitting cross connections between the city water supplies and an industrial water supply of inferior quality. An outbreak including several hundred cases of diarrhea, about 130 cases of typhoid and fifteen or more deaths has been the price paid for this lesson recently at Bloomington.

Owing to the shortage of Bloomington city water (resulting mainly from having to supply the city of Normal with water while it was having trouble with its own supply) the Chicago & Alton railroad shops at Bloomington were requested to use as little city water as possible, which resulted in pumping a mixture of creek water and city sewage into its industrial supply. The mains carrying this filthy water were connected with the drinking water main carrying pure city water in one of the shops and the two supplies were separated by a single gate valve. A normal pressure of 60 pounds was maintained on the city supply and a pressure of from 120 to 180 pounds was maintained on the railroad supply, thus tending to cause the polluted water to be forced into the city pipes. After